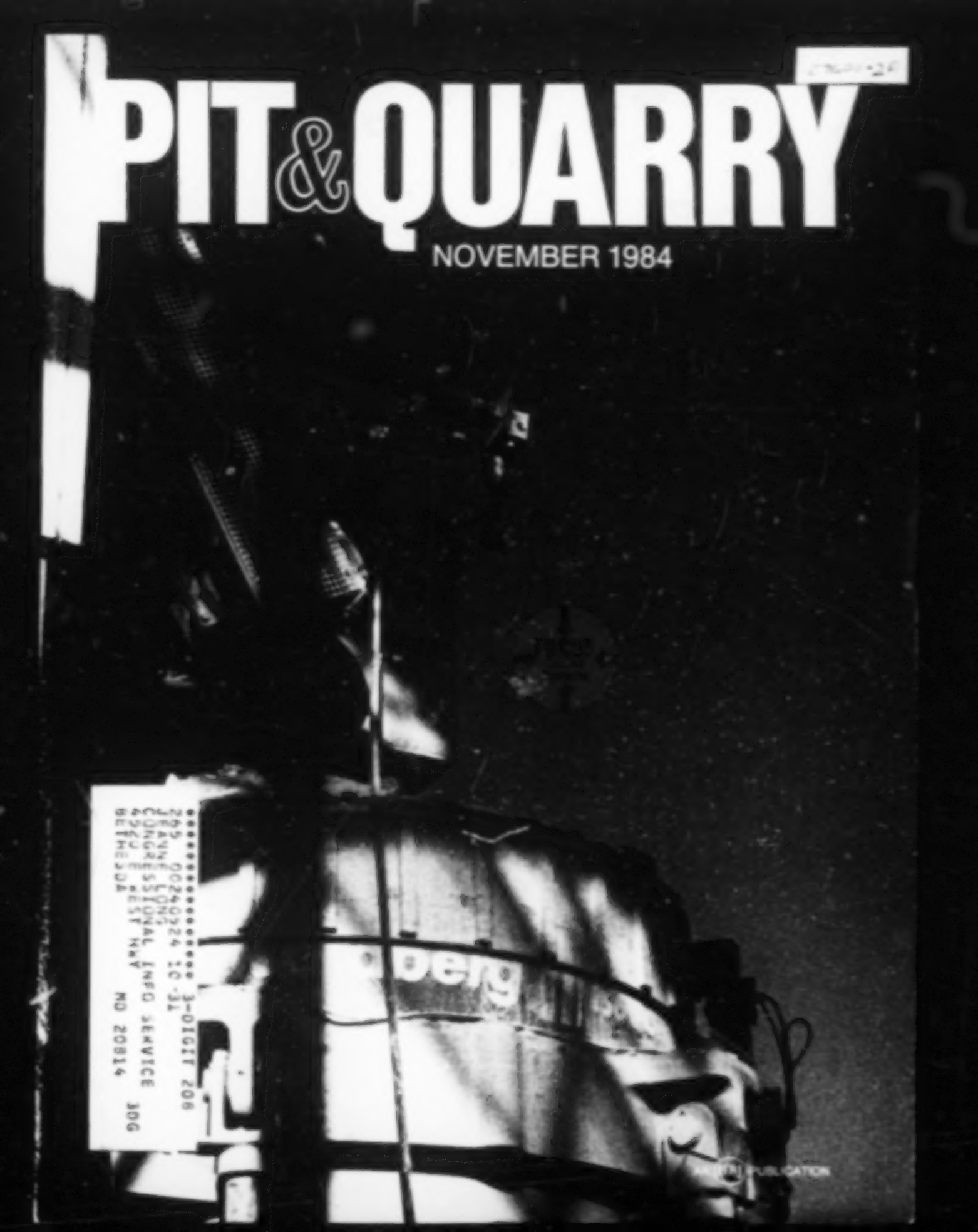
PIT & QUARRY

NOVEMBER 1984



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An ultrasonic level detection sensor, mounted above the crusher cavity, works with other sensors to provide automatic crusher control at Genstar Stone Products Co. facility in Maryland. Photo courtesy of Rexnord, Inc.

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PIT & QUARRY (ISSN 0032-0293) is published monthly by Pit & Quarry Publications, Inc., a subsidiary of Harcourt Brace Jovanovich Publications. Corporate Offices: 7500 Old Oak Boulevard, Cleveland, Ohio 44130. Advertising and Editorial Offices: 205 West Wacker Drive, Chicago, Illinois 60606. Accounting, Advertising Production and Circulation offices: 1 East First Street, Duluth, Minnesota 55802. Subscription rates: $12 per year in the United States and Canada. All other countries: $36 per year. Single copies (pre-paid only): $3.00 in the U.S.; elsewhere $5.00; add $3.00 for shipping and handling per order. Second class postage paid at Duluth, Minnesota 55806 and additional mailing offices. Copyright © 1984 by Pit & Quarry Publications, Inc., a subsidiary of Harcourt Brace Jovanovich, Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher. Microfilm copies of articles are available through University Microfilm, International, 300 N. Zeeb Road, Ann Arbor, Michigan 48106.

POSTMASTER: Send address changes to PIT & QUARRY, P.O. Box 6360, Duluth, Minnesota 55806-9914

ABC MEMBER VBPA ABP

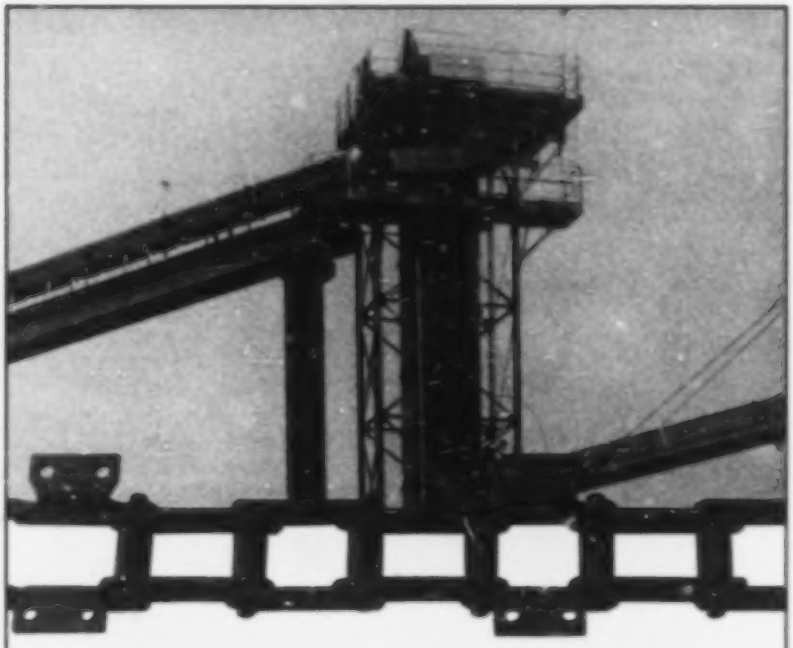
Comparison for 1984/1983 Construction Contract Values*

	8 Mos. 1984 ($000,000)	8 Mos. 1983 ($000,000)	Cumulative Percent Change
Nonresidential building	$ 48,389.1	$ 40,895.2	+18
Residential building	71,517.0	62,340.0	+15
Nonbuilding construction	24,812.9	27,787.0	−11
Total construction	$144,719.0	$131,022.2	+10

Dodge Index
(1977 = 100, Seasonally Adjusted)

June 1984 ..... 148 July 1984 ..... 152 August 1984 151

*Based on statistics compiled by F.W. Dodge Div., McGraw-Hill Information Systems



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- new raw pre-grinding and drying plant with autogenous gridning mill, and fitting out of the existing grinding line;
- burning line modified through the addition of a precalciner for the use of various solid fuels, and a grate cooler replacing the planetary cooler.

This equipment is to be in place by mid-1985.

ARTBA names Gerald Cichy to newly created post

Gerald R. Cichy, director of the Montgomery County (Md.) Department of Transportation for the past 5 years, has been appointed executive vice president of the American Road & Transportation Builders Association, according to chairman R.E. Hirschman. In the newly created position, Cichy will be in charge of operations and membership services for the national organization. He will report to president Daniel J. Hanson. As head of the Montgomery County DOT, Cichy led an organization of more than 1,100 employees responsible for the maintenance of more than 1,700 miles of road and the operation of a 200-bus transit fleet.

Air compressor guide features technical data

An air compressor selection and application guide, providing 28 pages of practical information on 1/4- through 25-hp compressors is available from the Compressed Air and Gas Institute. Developed by members of the Institute's Stationary Single Acting and Unit Type Section, the guide features a range of educational and technical data, including definition of compressed air, advantages of air power, types of air compressors, controls, and accessories, and installation guidelines.

In addition, the publication provides useful information on the protection, maintenance, and troubleshooting of air compressors, as well as a glossary of terminology, definitions, formulas, and preferred metric units.

The guide costs $2 and is available through the Institute, 1230 Keith Building, Cleveland, Ohio 44115.

NCSA conference explores trends in pavement design, material specs

Urge more use of manufactured sand in highway, general construction

By Don Michard

Studies aimed at increasing the use of manufactured sand in highway construction should be incorporated in pavement research programs, according to Robert M. McKeagney, Vulcan Materials Co., a speaker at the recent Conference on Crushed Stone for Road and Street Construction and Re-construction sponsored by the National Crushed Stone Association.

Attended by some 150 crushed stone producers and national, state, or local level highway transportation officials, the conference presented the views of national authorities on appropriate uses of stone products as well as design trends in highway construction.

Subjects covered included the updating of the AASHTO Interim Pavement Design Guide and the Strategic Transportation Research Study (also known as "STRS" or "STARS") Program; the latter proposes 5 years of concentrated research at a cost of $150 million.

The potential economic benefits of increasing the use of manufactured sand were noted by several speakers and discussed in detail by McKeagney; he focused on the impact of NCSA research, used by member companies to achieve more practical and realistic specifications for stone sand as the fine aggregate in concrete for pavements and structures.

McKeagney noted that, in the roughly 50-year period during which stone sand has been used, its special characteristics have received very little recognition. "Instead, use of manufactured sand has been allowed provided it could be made to look and act just like natural sand. In most cases, this required the washing out of valuable fine mineral particles, which we refer to as 'microsand,' that would

Some of the panel members at NCSA's conference on crushed stone for road construction and reconstruction, from left: Dick Barksdale, Georgia Tech; Adrian Pelzner, U.S. Forest Service; George W. Ring, FHWA; Gary Byrd, Transportation Research Board; and Harry Smith (at podium) also of TRB.

need to be replaced with portland cement, fly ash, or other fine particles to improve its workability," he said.

Manufactured sand, McKeagney noted, is different from natural sand in gradation, particle shape, and texture; each of these characteristics should be taken into account in specifications so that the most effective use of the material is made. "It is possible to produce a manufactured sand meeting essentially the same gradation characteristics as natural sand. However, when stone is crushed to produce fine sand particles, there always are minus 200 mesh particles in them--usually to the extent of 5-10%. Washing all those out changes the gradation and workability characteristics of the product."

McKeagney showed magnified slides of natural and manufactured sand in the size of minus 4 to plus 8. Natural sand, with rounded particles, exhibited relatively low voids. Manufactured sand, more rough and angular in shape, had more voids. "One way to handle this problem is to leave in those fines that we work so hard to wash out," he said.

The speaker cited NCSA Bulletin 13, published in 1936 and updated in 1964, in which conclusions were drawn indicating that increased fines could be tolerated in some concrete mixtures without ill effect. Another major point stressed by McKeagney: "Fines in manufactured sand, as small as minus 200 mesh material, are solid stone particles, not clay or silt that is considered deleterious material."

Studies by NCSA of manufactured sand used in more than 170 different concrete mix combinations, conducted during the 1970s, demonstrated a number of conclusions regarding the effects of particle shape and gradation on properties of both plastic and hardened concrete. McKeagney summarized the findings:

"Particle shape was not particularly critical to the slump characteristics unless extremes of flatness and elongation were reached that resulted in fine aggregate voids in excess of 53%.

Angularity itself did not require a significant increase in the water/cement ratio that is now associated with natural sand mixtures.

"The fines content can be increased in manufactured sand and the aggregate/sand ratio can be adjusted to permit the use of less sand for any given workability requirements.

"The water/cement ratio does not change significantly with a manufactured sand mixture. We're able to use less of that sand and increase the coarse aggregate factor so the amount of water going into the concrete does not change significantly."

When fines are removed from manufactured sand used in concrete mixes, workability can be increased by adding portland cement or fly ash, based on tests. "I think we'll agree that it is a lot cheaper to let the minerals in the sand do the job, not wash them out and replace them with something more expensive," McKeagney said.

"To date, few specifications have been modified to accommodate findings of the NCSA study; however, some change has taken place and hopefully will encourage further investigation of the subject."

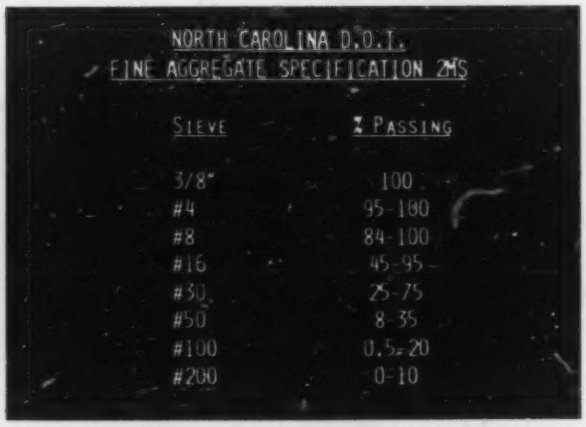
McKeagney reported that the North Carolina Department of Transportation recently conducted a study on the effects of increased fines in manufactured sand aggregates. "Following studies of several alternate gradations as they pertained to the properties of both plastic and hardened concrete, that agency chose to permit the use of fine aggregate containing as much as 10% minus 200 material. Use of the material was limited to specific projects over a 2-year period. Since January of 1984, manufactured sand aggregates were incorporated in their standard specification. Now, they permit up to 10% of fines through the 200 mesh screen and as much as 20% through the 100 screen. These specifications have been used in connection with numerous highway, industrial, and municipal projects. They are being well received by the ready-mix producers."

However, considerable research is needed in this subject, according to the speaker. "Several rock types have been investigated, but there is no assurance," he said, "that all rock types will produce a satisfactory product."

Statistics on the use of manufactured sand first were compiled in 1938 when an estimated 230,000 tons were produced. In 1982, an estimated 23 million tons were used, an increase of 100—fold in less than 50 years.

"Over that period, the nation's supply of aggregate material has undergone a gradual but noticeable change. In many metropolitan areas, natural sand supplies have been depleted or they've been made unavailable through the action of

U.S. production history for manufactured sand. (Illustration courtesy Vulcan Materials Co.)



Percentages of fines permitted in aggregate sand, North Carolina. (Illustration courtesy of Vulcan Materials Co.)

community development--local zoning boards and the like. The supply of natural materials for construction has tended to move farther out from most metropolitan areas. Transportation still is the major cost influence on such materials--once it has been produced at the plant--and in some areas it has become economical to replace natural sand with a manufactured product through crushing and classification at a site that may be closer to the area of need."

Keynote speaker David K. Phillips, director of the FHWA office of engineering, reviewed increases in federal funding that have led to accelerated highway re-construction and affected the economic health of the crushed stone industry.

Leon Noel, FHWA's pavement design chief, spoke on research and related topics, including the updating of AASHTO Interim Pavement Design Guide and the STRS program. Consultant Richard Alvin reviewed the evolution of flexible pavement design.

Robert B. McKeagney, Vulcan Materials Co., Birmingham, Ala., discussed the trend toward increased use of manufactured sand in highway and other construction aggregates.

Dr. Marshall Thompson, from the University of Illinois, analyzed the characteristics of subgrade and aggregate base materials that have significant influence on the behavior of flexible pavements under specific conditions.

Other speakers and their topics: Subsurface drainage systems were covered by Pat Ring of FHWA, Vic Mottola of New Jersey's DOT, and Dr. David Luhr of the Pennsylvania State University. Richard Root of Chicago Testing Laboratory talked on asphaltic mixtures and treatments, including all crushed stone aggregates; Richard D. Barksdale, Georgia Institute of Technology, covered thickness design for effective crushed stone use.

Frank P. Nichols, Jr. of NCSA, talking on "Meeting Pavement Needs," called for vigilance to prevent specifications from being watered down to allow a wide range of 'granular materials' subject to little, if any, process quality control.

Gary Maas, Harza Engineering Co., talked on aggregate selection and evaluation, expanding on a recent ACI Committee 221 report.

Harry Smith of the National Cooperative Highway Research Program of the TRB discussed the two major research programs now attracting the industry's attention: revision of the much-criticized AASHTO design guide for pavement structures (1972) and the proposed STRS program that could provide more than $20 million per year in pavement materials and design research. ●

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